

## THE PINK BOLLWORM OF COTTON IN PORTO RICO \*

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### ABSTRACT

The introduction, spread and present status of the pink bollworm, *Pectinophora gossypiella* Saunders, in Porto Rico are described. In order to understand the somewhat unusual conditions under which the insect is working in the Island the essential climatic and topographic features and the development of Sea Island cotton growing in Porto Rico are briefly outlined. Attempts at control are discussed together with the relation of alternate host plants as a factor in carry-over of the insect from one crop to another.

### CLIMATE AND TOPOGRAPHY

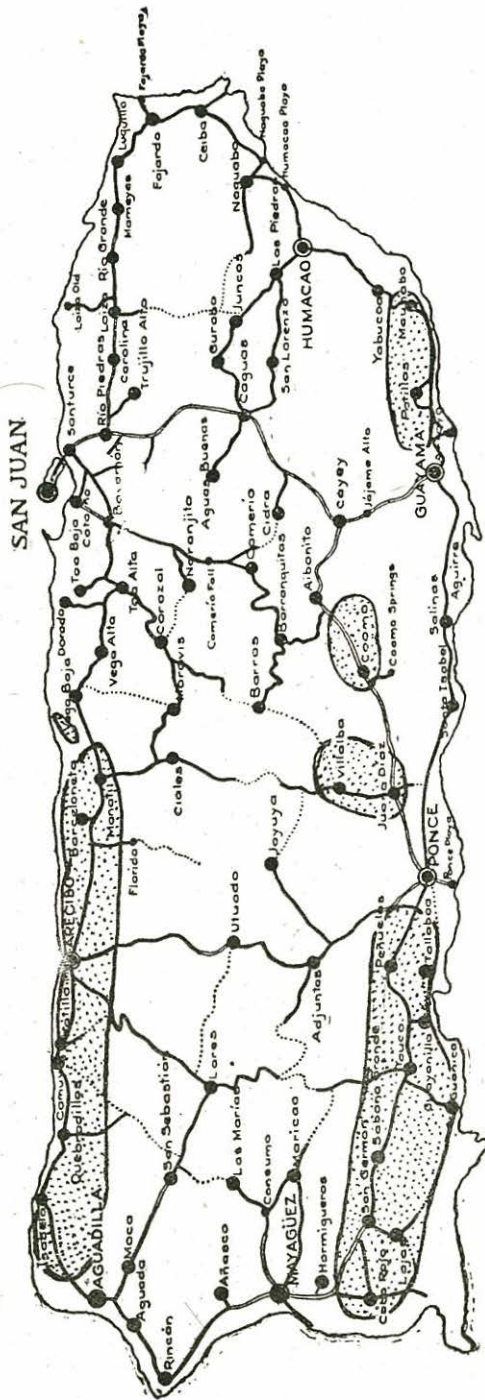
In order to gain an intelligent understanding of the pink bollworm problem in Porto Rico it is desirable to know something of the essential climatic and topographic features of the Island and of how the Sea Island cotton crop is grown there.

Porto Rico is about 90 miles long by 40 miles wide with an area of nearly 3600 square miles. It is roughly rectangular in shape, the long axis being East and West. In general the whole Coastal area is an irregularly narrow, fairly level strip, but the Island is for the most part very hilly, with a central chain of mountains running lengthwise, but nearer the South Coast, several peaks of which rise to over 4000 ft. above sea-level. The mean annual temperature is about 78°F. for the Island as a whole, there being but little difference between winter and summer temperatures. The rainfall for the whole Island averages about 71 inches for the year but differs greatly in different sections: the South Coast having about 45 ins. and the North Coast about 65 ins. The trade winds blow almost continuously in an easterly direction, thus concentrating the rainfall in the sections North and East of the mountains.

### COTTON IN PORTO RICO

There are two distinct cotton growing regions in Porto Rico—the North Coast and the South Coast sections. The North Coast section extends in an almost continuous strip from Aguadilla at the Northwest corner of the Island as far as Arecibo and in more spotted

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MAP OF PORTO RICO SHOWING PRINCIPAL COTTON GROWING AREAS, 1930-1931

patches eastward almost to Vega Baja, being confined to the more level coastal lands. In the South Coast the principal section is from Cabo Rojo at the Southwest corner westward almost to Ponce. This is mostly at a fairly low level near the coast. This past year considerable cotton was also grown at Patillas and Maunabo, both near the coast. There are however important plantings at Villalba and Juana Díaz and at Coamo which are at higher elevations. Cotton was grown in 1931 at Villalba at at least 600 feet elevation, which is undoubtedly the highest point at which Sea Island cotton has ever been cultivated anywhere in the world. (See accompanying map showing cotton growing areas in 1930-1931.)

Only Sea Island cotton is grown. This type was first cultivated commercially in Porto Rico, along with several other types in 1861 due to reduced acreage in the United States on account of the Civil War. Various types of cotton have however been long grown in Porto Rico and the plant was cultivated by the aborigines prior to the arrival of Columbus in 1493. In 1736 sugarcane, coffee and cotton were the three most important crops and in 1776 over 100,000 lbs. of cotton were produced. In 1837 it is stated\* that a little over 1 million pounds of cotton were shipped out of the Island. This production greatly declined during the ensuing years however due to increase of the crop in the Southern United States.

Since 1924 there has been a steady increase in acreage in the North Coast from 6500 acres to 1100 in 1931. In the South Coast however there were about 5000 acres yearly from 1924-26; it fell off greatly in 1927 but was up to 4500 acres in 1930 and in 1931 increased to 9,000 acres, thus making a total of 20,000 acres for the Island as a whole. This makes Porto Rico the largest Sea Island cotton growing section in the world.

For several years now all the cotton has been grown under contract for the San Juan Ginnery Co. which is subsidiary to J. & P. Coats Ltd. of Glasgow and the Clark Thread Co. of Newark, N. J., for export. The Company provides free seed and advances money for fertilizers, insecticides and cultivation expenses to the growers, all advances being deducted from the returns from the crop at harvest time.

#### THE PINK BOLLWORM SITUATION

The pink bollworm was first discovered in Porto Rico in July 1921 at Humacao at the East end of the Island. An immediate sur-

\* By Fray Inigo Abbad y Lasierra in his *Historia Geográfica, Civil y Natural de la Isla de Puerto Rico*, p. 326, Madrid, 1788 (New Edition, Acosta, Porto Rico, 1866).



vey following its discovery showed that the insect was present in all the important cotton growing sections. In the spring of 1922 the infestation was practically confined to the coast or its immediate vicinity but a year later infested plants (mostly wild cotton) could be found considerably inland in several sections.

The insect is thot to have been introduced with seed brought from St. Croix in 1920 which was widely distributed thruout the Island.

As far as can be determined the pink bollworm, altho present in all the cotton growing areas in the Island since 1921-23, was not any appreciable factor in the production of the crop until 1931. It is stated that the late crop in 1925 around Aguadilla was damaged from 3-5 per cent. In the crop harvested in 1930, for example, a light infestation could be found in many fields but this was mostly confined to the last picking and did but little damage. In 1931, however, caterpillars were present in almost the first picking of the earliest fields observed during the fore part of January in the South Coast. Continued observations showed that the infestation increased until by the end of the crop in April and early May many fields could be found in the South Coast with as high as 95 to even 100 per cent of the bolls infested. It is estimated that there was at least a reduction of 15 to 20 per cent of the crop on account of the pink bollworm and it actually was probably even greater than that.

In the North Coast section the situation was somewhat the same and for the first time also. One very early planted field examined at Hatillo on May 5, 1931 was so badly infested at the time that it was reported to have been practically worthless two weeks earlier. Another field, for example, near Aguadilla showed a high infestation in the first crop in June, often two or three caterpillars being found in one boll or a large caterpillar in a small boll.

#### ALTERNATE HOST-PLANTS

The question of alternate host-plants is an important one in Porto Rico since they produce fruit continuously thruout the year thus making possible continuous breeding of the pink bollworm thruout the year. Wild tree cotton is rather thinly but widely distributed thruout all sections despite several previous efforts to eradicate it. Especially in the South Coast it is a constant menace to the cultivated Sea Island crop, where less thoro clean-up work has been done than in the North Coast cotton growing sections.

In 1923 it is reported that the then Agricultural Agent in Camuy found the fruits of the maga tree, *Montezuma speciosissima* infested by pink bollworm larvae. Apparently almost no further ob-

servations on this tree as an alternate host were made until this past year. On May 5, 1931 Mr. U. C. Loftin and the writer collected 50 fruits from a tree near Aguadilla of which 2 were infested, each containing a live larva. Dr. Geo. N. Wolcott states that early in October, after most of the crop had been harvested he found maga fruits as high as 70 per cent infested, with often two or three larvae to a fruit. This tree is undoubtedly an important factor in maintaining the pink bollworm population between one cotton crop and another. It is common at the lower elevations, especially in the Central and Western parts of the Island. It has been extensively planted along the main coastal roads for ornament and shade, since it has showy crimson flowers and large dark green leaves and often reaches a height of 40-50 feet. The fleshy fruits form thruout the year. Besides being used for shade and ornament the wood is said to be used for furniture, musical instruments, posts and the like and it is claimed that hardship would be caused by having these trees destroyed in the cotton growing areas.

Another Malvaceous tree, locally called the "emajaguilla," *Thespesia populnea*, is also an alternate host of the pink-bollworm but it is of relatively minor importance. Mr. Loftin and the writer examined fruits in several localities on May 4 and 5, 1931, with negative results but one sample of 50 fruits collected near Yauco on May 4 had one which contained a live bollworm. This tree is more common in some sections of the Island than the maga and grows well up in the mountains as well as in the coastal sections along the main roads. It seems to have a more definite fruiting period than the maga.

During the past year it has been established by inspectors of the U. S. Plant Quarantine & Control Administration and by Dr. G. N. Wolcott that okra growing near badly infested cotton is liable to infestation. Dr. Wolcott's observations further show that even the very small marketable pods only a few days old, become infested when the plants are growing near badly infested cotton but that infestation does not occur when the cotton is only moderately infested.

#### ATTEMPTS AT CONTROL

Very soon after the discovery of the pink bollworm in Porto Rico a project was outlined to destroy all the wild tree cotton, especially in the Eastern end of the Island—the original place of the discovery of the insect, but was abandoned when the distribution of the pink bollworm was found to be so extensive.



Since that time all cotton seed has been fumigated at the San Juan Ginnery Company's gin at Martín Peña, which is the only gin in use on the Island. The standard carbon bisulfide treatment has been used at the rate of 1 lb. per 80 cu. ft. for at least 24 hours. The fumigation rooms are tight and the work is done under the immediate supervision of an inspector of the Insular Plant Quarantine Service. As far as we have been able to determine this fumigation has always been highly effective.

As before stated it has been estimated that at least part of the crop of 1925 was damaged from 3-5 per cent. During this year the Porto Rican Legislature passed a law empowering the Commissioner of Agriculture to declare cotton a public nuisance during certain specified periods of each year. These were set as follows: for the South Coast from May 15 to July 30 and for the North Coast from October 15 to December 31. This law provided for the destruction of all Sea Island cotton by the start of the "closed season" and wild cotton was declared to be a public nuisance during any time of the year.

Some effort has been made each year since that time to carry out this law but for various practical reasons only partial success has been obtained. The great increase in the amount of damage to the crop, harvested in 1931, however, greatly stimulated efforts to make the closed season for Sea Island cotton and the destruction of wild tree cotton more effective. A series of meetings were held in each of the ten principal cotton growing towns in the South Coast the week of April 20th. These were well attended by the cotton growers and at each meeting representatives of the Insular Experiment Station, of the Agricultural Extension Division and of the San Juan Ginnery Co., attempted to explain exactly the meaning of the closed season and the reasons for it. Despite this effort on the part of those charged with the welfare of the cotton growers, success was only partial. It was estimated that by May 15, the date set for the start of the closed season and therefore of the completion of the destruction of the old crop, only about 5 per cent of the old crop remnants had been destroyed. By June 1 about 50 per cent of the old plants had been pulled out and destroyed and it was not until the end of the month that the work was anything like even fairly well accomplished. Little had been done by that date however in the Guayama-Maunabo section where the crop had been planted late. Wild cotton had been cut down and destroyed to a large extent but in some places little had been done by the end of June and much still remained even by November 1st. It is thus seen

that the theoretical "no cotton" period of three and half months was cut down to at best not more than one month and even at that a great many wild tree cotton plants were never destroyed at all.

In the North Coast the closed season for 1931 was advanced to October 1 this year and altho the growers in this section have always been more progressive, since they have been more dependant on cotton as a cash crop, the results to date have been far from satisfactory. It is estimated that by October 20 about 75 per cent of the old cotton plants have been pulled out but of these only about one-third have been burned. Very little of the clean-up work had been accomplished by October 1st but this was said to be because of the understanding among many growers that the closed season was not to start until October 15 as previously agreed. The clean-up has apparently been good in Camuy and fairly complete in Isabela but poorest in Hatillo and Vega Baja, which latter two localities were undoubtedly the worst infested during this past year.

Due primarily to differences in the distribution of rainfall but also to differences in the distribution of available labor the planting, growing and picking seasons for cotton are quite different in the two principal sections. This is shown in the following table.

TABLE I  
SHOWING PLANTING, PICKING AND CLOSED SEASON IN THE COTTON  
AREAS OF PORTO RICO

(PREPARED BY J. PASTOR RODRÍGUEZ).

Cotton Section	Planting	Picking	Closed Season
North Coast.....	January, February and to March the 15th	June, July, August and September	From October 10 to January the 1st
South Coast.....	August and September.	February, March, April and May	From May 15 to August the 1st.

Because of the difference in planting season in the North and South Coasts commercial plantings of cotton are growing in the Island during every month in the year. It has therefore been most emphatically suggested by Mr. Loftin, during this past year that the planting season by synchronized in both the North and South sections, thus permitting a "no cotton" season for the whole Island at the same time. This is highly desirable if not absolutely essential to successful pink bollworm control but for various practical and economic reasons it seems impossible of accomplishment at present. In such an event, however, it would probably be best for the North Coast to change to the planting season of the South Coast but the seasonal distribution of labor and of alternate crops seem to be strongly



against making such a radical change. Another alternative advanced is that the South Coast abandon the growing of cotton entirely. This many growers do not wish to do even with a price of not more than 6¼ cents a pound guaranteed for first grade-seed cotton for 1932.

It has recently been proposed to take a holiday from cotton growing in the Island for 1932 but neither does this proposition does find favor among many growers and also the crop in the South Coast had already been planted.

For various practical reasons, therefore, the successful carrying out of possible measures for the suppression of the pink bollworm looks rather dubious and it is anticipated that considerable loss to the crop may result during the coming year. There have been planted only about 1400 acres in the South Coast for the coming crop as against 9000 acres this past year and it is estimated that the North Coast crop will be much less than the acreage of 1931. The pink bollworm infestation has built up to an alarming extent during the past year and for this coming year there may be at least as many if not more worms present to infest less than one-sixth of the previous acreage in the South Coast and not more than one-half the previous acreage in the North Coast.

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